Due: Friday, 10/03, 2:10pm, PHYS360 Assignment 5
Reading:

1. Griffiths, Ch.2, page 78-82 and and Ch.3 pages 93-96
2. No reading quiz this week.

Problems:

1. A free particle is located at $x = a$ at $t = 0$; i.e., its wavefunction at $t = 0$ is given by

$$\Psi(x,0) = \delta(x-a)$$

Find the wavefunction $\Psi(x,t)$ at a later time t. Hint: To evaluate an integral of the form $\int_{-\infty}^{\infty} e^{i\lambda x^2 + i\beta x}\,dx$ set λ to $\lambda + i\varepsilon$ with $\varepsilon > 0$ so that the integral is convergent. Then complete the square in the exponent of the exponential and change variables. The $i\varepsilon$ in your answer will allow you to decide whether to take the positive or negative square root. Finally let $\varepsilon \to 0$.

2. Consider scattering of a particle with energy $E > V_0 > 0$ from a potential

$$V(x) = \begin{cases} 0 & x < 0 \\ V_0 & 0 < x < a \\ 0 & x > a \end{cases}$$

Show that if the wavelength of the particle in the region $0 < x < a$ is such that $n\lambda = a$ then no reflection occurs. Hint: Calculate the transmission probability first. Give a physical explanation for this result.

3. Calculate the transmission probability for a particle of mass m incident on a potential

$$V(x) = \alpha[\delta(x+a) + \delta(x-a)]$$

4. Problem 2.26, pg 77
5. Problem 2.29, pg 82
6. Problem 2.44, pg 87